COPPER-CARBONATE TREATMENT FOR STINKING SMUT OF WHEAT

Excerpts from 1925 Annual Reports of
County Extension Agents

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*No attempt is made to cite all references to stinking smut of wheat in this circular. Only selected extracts showing typical methods employed and results obtained in a number of States are included. Owing to differences in terminology used in various States and to other local conditions, the information contained herein should be reviewed by the State subject-matter specialist concerned before incorporating any part of it in the extension program for the State.

Stinking Smut Causes Severe Losses to Wheat Growers

This disease of wheat, known to farmers in some sections as bunt or "bust," has caused severe losses in wheat-growing States during recent years. The damage caused by stinking smut is three-fold:

(1) Wheat, which is attacked in the field, is actually destroyed so that an infestation of 4 to 8 per cent means a material reduction in yield.

(2) An excessive amount of bunt in threshed wheat destroys its usefulness for certain purposes, and this is directly reflected in dockage at the elevator or mill.

(3) Wheat which grades smutty requires special processing at the mill, thus adding to the expense of milling.

(4) Separator explosions at threshing time, due to ignition of clouds of smut dust released in the separator may result in heavy property damage.

Losses can be Prevented by Disinfecting Seed Wheat

Seed treatments for control of this disease with formaldehyde and copper sulphate have been applied for a number of years and in the West farmers in certain sections have made a regular practice of disinfecting their seed wheat. More recently the use of copper-carbonate dust as a seed disinfectant has been developed. This means of disinfecting seed immediately became popular among the farmers in the West where seed treatment was an accepted practice. In the State of Washington, for example, where the work started with ten 1-acre demonstrations in 1921, the copper-carbonate treatment was found so satisfactory that by 1924 over 1,500,000 acres were sown with grain treated by this method.

County Agricultural Agents Tell of Seed-Treatment Work

Of all State and Federal workers the county agricultural agent has been most closely associated with the practical application of the treatment. Consequently at this time, when smut has become of increased importance as a cause of loss in the wheat industry, it is worth while to see what these men have to say about copper carbonate. The 1925 reports from men working in the wheat-growing States clearly indicate that the copper-carbonate dust as a seed disinfectant is rapidly replacing other methods of controlling wheat smut for the following reasons:

(1) This treatment is effective to a high degree, resulting in increased yields.

(2) Its use gives less seed injury and retarded growth than wet treatments, thus reducing the amount of seed used per acre.

(3) Application of the dust treatment is a more convenient process than is the case with the wet treatments.

(4) Seed can be treated some time before planting, thus making it possible to do the work in slack seasons.

(5) Treated seed is safer from reinfection in the soil than that treated by the bluestone method. This is important in the Northwest where the disease lives over in the soil.

Some of the methods successfully used by county agricultural agents in introducing this new method of wheat seed treatment are:

(1) Propaganda work to bring about a widespread knowledge of the new seed disinfectant through news items in the local press, meetings, circular letters, posters, exhibits, lantern slides, and similar means.

(2) Method demonstrations to show farmers:
(a) How to build treating machines.
(b) How to use treating machines.
(c) Proper methods of applying dust.
(d) Use of masks to prevent inhaling of copper-carbonate dust.

(3) Result demonstrations to prove that this method of seed treatment results in
(a) Increased yields.
(b) Decreased dockage at the elevator.

Best results have been obtained where the cooperation of commercial service agencies such as elevator managers, warehousemen, millers, druggists, hardware merchants and manufacturers of treating machines has been obtained. This cooperation has resulted in:
(1) Centralized custom treating at elevators and mills.
(2) Ample supplies of quality chemicals being available.
(3) Ready access to directions for treating seed.
(4) Dealers being stocked with seed-treating equipment.

The two following precautions should always be kept in mind if optimum results are to be obtained:
(1) Directions must be carefully followed to obtain maximum control.
(2) Use of masks and treating in a well-ventilated building or in the open air will prevent nausea caused by inhaling copper-carbonate dust.

Beyond a doubt during 1926 there will be a tremendous increase in the use of this treatment throughout the entire wheat-growing areas, resulting in a material saving to the wheat growers of the United States.

Arizona

A demonstration of the dry copper-carbonate treatment for grain smut was conducted early in the year. This demonstration, together with similar demonstrations staged during the past three years, has given uniformly satisfactory results. In fact, this method of treatment has been so successful that a local milling firm that handles the majority of the seed wheat of the county has been induced to provide facilities for treating all of their seed wheat by this method. This means that practically all wheat planted in Graham County this fall and winter will be treated for smut by this method. - J. W. Wright, County Agricultural Agent, Graham County.

California

This concludes the third year since the introduction of the use of copper-carbonate dust for the control of bunt in wheat. The first year 500 pounds of dust were used. This year the dealers handling dust report 2,200 pounds sold, which was sufficient to dust seed grain for planting over 8,000 acres. It is estimated that about 20,000 acres of land are sown to wheat each year in the county. The first year the dust method was tried the seed and dust were mixed with a shovel or barrel churn. The buying of machines to treat seed was encouraged, and at the present time there are approximately 18 seed-treating machines in the county. These are circulated among the growers each year at seed-treating time. A local mill installed a seed-treating machine and reports that last year they treated 1,375 sacks of seed wheat.

Reports were secured from 14 growers who treated approximately enough seed to sow 4,000 acres of grain, and in every case smut was reported controlled. The labor costs of the dust method of treatment as compared to other methods were reported to be the same. The stand of wheat was usually reported excellent, and, in a number of instances, very good. The only disadvantage reported for this method was the danger of sickness on the part of the operator. Over half of those reporting stated that sickness caused from inhaling the dust was the chief disadvantage.

It is evident from the foregoing that the copper-carbonate method for controlling bunt in seed wheat is very successful, but that there remains educational work yet to be done regarding care in handling dust to prevent sickness. - H. E. Droblish, County Agricultural Agent, Butte County.

Two years ago a demonstration was conducted to show the value of copper carbonate as a method of controlling smut in wheat. The demonstration was so effective and so convincing that this has become the common method of controlling smut in the Lincoln section. Last year 54 grain growers in western Placer County used the copper-carbonate method and only 3 used the bluestone method. This year there will be no wheat sown in the Lincoln section which has not been treated by copper carbonate. Two thousand seven hundred pounds of copper carbonate was sold during the past year for grain planted this last fall. - Roy D. McCallum, County Agricultural Agent, Placer County.

The treatment of seed wheat for smut is the result of work started along this line two years ago in which the method of treating with copper-carbonate dust was demonstrated. This practice has continued to grow since that time and, although Santa Barbara County is not primarily a wheat-growing section, it is estimated that 50 per cent of the farmers growing wheat are now using this method of seed treatment. Twelve new farmers applied copper-carbonate for the first time during the past year and three new dusting machines were constructed. - B. L. Hagglund, County Agricultural Agent, Santa Barbara County.

This project has passed the demonstration and campaign stages and about 90 per cent of the farmers in Solano County are now using copper-carbonate dust for smut control. - J. W. Mills, County Agricultural Agent, Solano County.

No active campaign was carried on this year in smut-control work. The grain growers here, however, have accepted the copper-carbonate method of treating wheat as the best method and as many as can, treat their seed in this way. One warehouse in Oakdale treated most of the seed wheat for that section in their scratch feed mixer this past season. The manager states, however, that he will not be able to do this again as the dust in the air has a detrimental effect upon the men breathing it. It is hoped that some arrangement can be made to eliminate this trouble as it is a very convenient method of getting the seed wheat for the whole district treated. - A. A. Jungermann, County Agricultural Agent, Stanislaus County.

A campaign put on by the extension service during the fall of 1925 to promote the use of copper-carbonate for treating wheat for stinking smut resulted in almost unanimous use of this method by most of the grain farmers in the county. Last year close to sixty per cent of all the wheat in the county was treated by this method. In 1925 the percentage was much higher. In a very few years the copper-carbonate methods will be used entirely by grain growers of Tehama County as a means of combating stinking smut in wheat. - D. M. Smith, County Agricultural Agent, Tehama County.

Colorado

Another item under crop work which came in for emergency activity was the matter of seed-wheat treatment for smut. A large amount of smut was prevalent the past season. Every wheat grower who failed to treat his seed suffered a big loss from smut. This was true over the entire wheat belt of eastern Colorado. A campaign to get farmers to treat their seed wheat was put on in cooperation with the State Agricultural College, the C. B. & Q. Railroad, and the Denver Chamber of Commerce. As a result of this campaign enough wheat was treated according to the recommendations given to plant approximately 60,000 acres. This covers almost half of the winter-wheat acreage in this territory. One year ago less than 6,000 acres were planted with treated seed. We believe this was one of the most successful campaigns ever put on in this county. - J. E. Morrison, County Agricultural Agent, Logan County.

A general campaign was conducted last spring to demonstrate the use of copper-carbonate for controlling smut of wheat. Some 20 demonstrations were given in as many different places and approximately 100,000 pounds of wheat were treated by this method. In checking over the results of the work this fall I have found no one who has had any smut in the wheat so treated. On account of the evident advantages of this method of treating seed wheat and the general publicity and actual demonstrations given last spring, this method will be quite generally used here for treating wheat. - R. H. Tucker, County Agricultural Agent, Montrose County.

Delaware

For some years the University of Delaware has been endeavoring to aid the farmers in the control of stinking smut of wheat. The method that was advised was the formaldehyde treatment. Because of the difficulties in handling this treatment and because of the possibilities of injuring germination of the seed, the treatment has not been adopted to any appreciable degree. In 1925 the department of plant pathology of the University of Delaware advised the use of the copper-carbonate treatment. This method is both simple and effective.

Methods: (1) Meetings were arranged in cooperation with the local grain dealers in two of the major wheat-growing sections of the county.

(2) Dr. T. F. Manns and Dr. J. F. Adams of the University of Delaware demonstrated the treatment of seed wheat for stinking-smut control through the use of copper-carbonate.

(3) Local grain dealers were induced to lay in supplies of copper-carbonate as a convenience to the farmers.

(4) Two demonstrations were arranged showing the value of this treatment in the control of smut in wheat.

Results: The results of the demonstrations cannot be measured until next season. The number of farmers who adopted this method of treatment this year was comparatively small; however, it is thought that as the farmers become more familiar with the method its use will become more general.

Publicity: The county papers carried articles relative to this method of smut control in wheat. - R. O. Bausman, County Agricultural Agent, New Castle County.

Idaho

Two demonstrations have been conducted on the use of copper carbonate in the control of smut in wheat. The copper carbonate was applied at the rate of 3 ounces per bushel. A home-made mixer was used which worked on the same principle as the barrel churn. The copper carbonate used was a very fine quality which covered the grain quite evenly. The treated grain, which showed considerable smut at the time of treatment, was planted in one demonstration on ground which was badly infested with smut the previous year, whereas in the

other demonstration the seed was planted on clean ground. A check was taken by the owners at different times throughout the growing season and at threshing time practically no smut was found in either treated field, but in the adjoining fields which were not treated smut was very severe. - F. L. Williams, County Agricultural Agent, Gem County.

Five smut-control demonstrations were conducted during the season of 1924. These were carried over in 1925 to determine the results of this work. Approximately 1,400 acres were treated with copper-carbonate. The grain treated with copper-carbonate gave such splendid results as compared with bluestone treated wheat that 15 demonstrations were started with this chemical in one community and 8 in another. A total of 7,000 acres were treated. On each of the farms conducting the demonstrations either formaldehyde or bluestone was used as a check.

Four commercial machines were purchased and five home-made power machines were constructed for this work. Three or four barrel machines were made which gave fairly good results.

One firm manufacturing treating machines was induced to bring a machine into the county and conduct demonstrations. This machine was set up in Rockland and created considerable interest. It was also set up in American Falls for two days at which time about 300 bushels of wheat were treated for demonstration purposes.

The bulk of the demonstrations this year are in the Rockland and Roy communities. Some of the leading farmers in these two communities are conducting the demonstrations. One demonstration was started in the Arbon Valley this fall on the farm of Wm. Allard. This is the first in this community. - L. E. Tillotson, County Agricultural Agent, Power County.

Illinois

During the past year, many farmers treated their wheat for smut, most of them using the copper-carbonate treatment. The experimental plats in Clark County from the seeding of 1924 show that the copper-carbonate treatment gives the best results and is more easily applied. - W. W. Merritt, County Agricultural Agent, Clark County.

There was less development of the covered or stinking smut in wheat the past year than previously, although local outbreaks occurred. One would be led to conclude from this, that the treatment of seed wheat during the year, and especially during 1923, when over 19,000 bushels were treated with the copper-carbonate dust, has a decided effect in checking this disease. Although considerable activity was apparent, no definite records could be obtained this fall on the amount of seed wheat treated with copper-carbonate. Farmers were urged to study the situation with respect to the spread of stinking smut, with a view to detecting any local outbreaks and taking action to prevent its spread, not only by treatment of the seed with copper carbonate, but by proper cleaning of threshing machines before moving from an infested farm, and by avoiding the use of seed which was known to be infested with the disease. - B. W. Tillman, County Agricultural Agent, Belleville, St. Clair County.

Indiana

In the fall of 1924, 800 pounds of copper carbonate were used for treating wheat for stinking smut. Ordinarily there is so little stinking smut in the county that farmers do not treat their wheat. The seed used in 1924, however, was very heavily infested with smut. As a result of the treating there was a very small amount in 1925. - S. R. Miles, County Agricultural Agent, Columbus, Bartholomew County.

Demonstrations in the control of stinking smut of wheat were started in 1924 and completed in 1925. During the last few years the amount of stinking smut in the wheat of Howard County has been on the increase. In some cases the infection was so heavy that elevators reduced the price as much as 15 cents per bushel. Five farmers were to be induced to attempt the control of stinking smut.

Methods: (1) The prevalence of stinking smut was advertised by means of articles in the newspapers of the county. These articles cited specific cases where farmers had been forced to take a reduced price for their wheat because of the stinking smut.
(2) Three meetings, located at strategic points, were arranged.
(3) Proper publicity was given these meetings through the press and at meetings of farmers.
(4) At these meetings the use of copper carbonate as a seed disinfecting agency was advocated and its application to seed wheat demonstrated.

Results: (1) Sixty-eight persons attended the demonstration meetings.
(2) The druggists, who handled the chemical reported the sale of 156 pounds of copper carbonate.
(3) Wherever it has been possible to check results, the use of copper carbonate in the control of stinking smut has given satisfactory results. - Calvin Perdue, County Agricultural Agent, Kokomo, Howard County.

During the harvest of 1922 it was determined that stinking smut infected approximately 20 per cent of many of the fields in Rush County. During the fall of 1923 and 1924 active campaigns were conducted which encouraged farmers to treat their wheat with copper-carbonate to prevent stinking smut. During the harvest of 1925 grain dealers reported few farmers delivering wheat which had a low test due to smut infection. - H. D. Van Matre, County Agricultural Agent, Rush County.

In the fall of 1924 stinking smut of wheat was very prevalent and approximately 15,000 bushels of wheat were treated. The dealers sold a little over 3,000 pounds of the copper-carbonate. This year checks were made on 20 farms where the treated seed had been used. Not more than a trace of smut was found and that was from seed wheat which had not been mixed with the carbonate in a very thorough manner, but had been turned like concrete on a floor. Five threshing rings were also visited during threshing to find the amount of infection in the threshed wheat. Just a rare kernel was smutted. No dockage was heard of where the wheat was treated this year. Some of the wheat carried as high as 30 per cent infestation last year. - H. D. Jackson, County Agricultural Agent, Shelby County.

Kansas

An epidemic of smut in wheat provided the necessity and also a good opportunity for an intensive smut-control campaign.

A special method used in calling meetings or advertising demonstrations was the use of circular letters, most of which carried a diagram of some sort to attract the attention of the reader. The county was circularized in this way several times. In the case of the smut-control campaign this method was a part of an intensive publicity campaign in which posters, stickers, slides in motion picture houses, a slogan, etc., were used.

A smut-control campaign was not a part of the regular plan for the year. The opportunity presented itself when a great deal of smut appeared in the wheat. A series of demonstrations was put on. This included a demonstration in every township in the county except two. For these demonstrations a large smut-treating machine was borrowed from Mr. C. G. DeVore of Dent Township. Mr. Devore obtained this machine through the farm bureau last year. A 4-wheeled trailer was lent by a garage, and a power jack was lent by one of the farmers' cooperatives. With this equipment the demonstrations were put on. At each demonstration at least 50 bushels of wheat were treated with copper-carbonate dust and each farmer whose wheat was treated was asked to keep a record of where that seed was planted. He was also asked to plant a check plat of untreated wheat beside the treated wheat. D. R. Porter, extension plant pathologist, spent two days in the county during this campaign.

This series of demonstrations was supplemented by an intensive publicity campaign. This included the use of a slogan, "Treat your wheat for smut," in over 50 per cent of the display advertising running in the local papers during the campaign. Advertisers were interested enough to donate the space for this. The same slogan was put on cards which were posted in conspicuous places all over the county, especially in elevator driveways, and the like. It was printed on gummed labels and these were stuck on cars, trucks, and other conspicuous places. Motion picture houses carried the slogan also. Two sets of circular letters were sent to every farmer in the county in addition to circulars sent to each farmer in a given community preceding the demonstration in that community.

The campaign resulted in 20,000 acres of wheat being planted with seed treated with copper-carbonate dust for the first time, and 12,000 acres being planted with seed treated with formaldehyde above what was treated last year. This is 23 per cent of the county's wheat acreage and is about 133 per cent more than was treated last year. - E. Bruce Brunson, County Agricultural Agent, St. Francis, Cheyenne County.

Our entire efforts in this field were confined to the control of bunt or stinking smut of wheat. All Blackhull wheat had been badly smutted the past season, and since 75 per cent of the wheat being sown was this variety we played this fact up strongly by the use of the newspapers, letters and personal lectures. We were advocating the use of the copper-carbonate dust method and attempting to get the farmers to treat during the lull in work just before seeding time. We failed in the latter attempt, however, for about two days before seeding time approximately 100 farmers were demanding copper carbonate with which to treat their wheat. Some delay was inevitable,

but within one week they were all supplied with whatever amount they desired. I feel that at least 3,000 bushels of wheat were treated, and had the farm bureau been able to purchase a regular treating machine we could have routed it through the county and treated three times as much. Perhaps next year we shall. - E. C. Smith, County Agricultural Agent, Marion, Marion County.

Smut control holds a large place in the wheat project. About 5,000 pounds of copper carbonate were distributed through this office. With the amount obtained elsewhere, and the amount of formaldehyde sold, it is estimated that about 70 per cent of the wheat acreage was treated for smut. The impetus of an intensive campaign in 1924 carried itself on into 1925. A smut-treating machine company sent a salesman into this territory, who sold 36 machines. These were bought by 150 farmers. Cement mixers and home-made machines were also used. Mr. D. R. Porter, specialist from Kansas Agricultural College, assisted two days during the latter part of the season. - Carl Carlson, County Agricultural Agent, Atwood, Rawlins County.

Three weeks were spent in demonstrating methods of smut control, and extensive publicity was given to the subject for about 6 weeks prior to the seeding season. The copper-carbonate method of control was recommended unreservedly for the first time. Twelve farmers purchased treating machines, and about 12,000 acres were treated this year by 25 farmers. One machine treated the seed for 4,000 acres of wheat. All the machines but 2 were purchased jointly by 2 or more farmers. This picture should be almost universal in 2 or 3 years if continued as it started this year. Gilbert L. Cleland, County Agricultural Agent, Goodland, Sherman County.

Maryland

There was a large percentage of bunt in the wheat harvested this past year. Five seed-wheat-treating method demonstrations were put on in Caroline County during September, 1925. I was assisted at the demonstrations by F. W. Oldenburg, field crops specialist and Dr. R. A. Jehle, plant disease specialist, the copper carbonate or dry treatment being used. Also, arrangements were made with the Farm Bureau Copperative Association to order a stock of the copper carbonate so it would be available for the use of the growers who desired to treat their seed. The demonstrations resulted in 24 growers treating their wheat for the control of smut. The 24 growers treated 1,050 bushels of seed or a sufficient quantity to seed 700 acres. Results on these demonstrations will be reported next year. - L. M. Goodwin, County Agricultural Agent, Denton, Caroline County.

In a number of communities in the county stinking smut or bunt in wheat is becoming prevalent. Farmers were docked heavily on the price of wheat and in some cases wheat was rejected at the elevators on account of the presence of this disease.

Accordingly the county agent arranged for a series of demonstrations on the control of this disease by the copper-carbonate dust method. Messrs. Oldenburg and Hunter of the University of Maryland with a home-made barrel mixer assisted the county agent in putting on method demonstrations at a few points. A number of farmers were then assisted in constructing mixers and rigging up old barrel churns, and the like, for applying the dust. Eighteen demonstrations were put on in 11 communities in the eastern and southern parts of the county where stinking smut is most prevalent. In a number of instances farmers insisted upon leaving a part of their seed wheat untreated. Consequently, it will be easy to get accurate data next year on the effect of this treatment. One method demonstration was given where seed wheat was being cleaned in a fanning mill, and from the fanning mill the wheat was run through the dust-mixing barrel. This wheat was then sold as treated seed wheat at an increase of 10 cents per bushel. - M. C. Moore, County Agricultural Agent, Hagerstown, Washington County.

Minnesota

Two days were spent in the county by R. C. Rose, specialist on plant diseases. The two things Mr. Rose especially emphasized were the use of copper carbonate in treating wheat smut and hot formaldehyde for potato diseases. Over 30 inquiries were received at the farm-bureau office in regard to these treatments. At Morristown, Webster, and Lonsdale, Mr. Rose demonstrated their use. Druggists at Northfield and elevators at Webster, Morristown, and Lonsdale report the use of about 400 pounds of copper carbonate in treating wheat for smut. Treated fields when examined showed no stinking smut at all. - P. A. Johnson, County Agricultural Agent, Fariboult, Rice County.

Montana

A demonstration with copper carbonate and formaldehyde proved conclusively that the dust was superior. The copper-carbonate treatment is being used because it can be applied at any time and there is no danger of low germination. - P. M. Lewis, County Agricultural Agent, Miles City, Custer County.

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Smut of wheat has been effectively controlled by formaldehyde treatment for some time, and practically every farmer has treated his grain with the formaldehyde at least every second year. With the introduction of the copper-carbonate dust treatment, many have found that this treatment is more convenient, is as effective, and is not injurious to germination. Demonstrations have been carried on in nearly every community, and it is estimated that practically 100 farmers have used this treatment in the past season.

Results: The copper-carbonate method has been found to be highly satisfactory. Although its cost is not as small as formaldehyde, it has been found that with the higher germination and the convenience in seeding, it is a profitable treatment to use. It is believed that this treatment should be indorsed and encouraged as much as possible. - A. W. Warden, County Agricultural Agent, Scobey, Daniels County.

No organized project was carried out regarding the use of copper carbonate. Newspaper articles and one circular letter were prepared, and the 1924 results were reported at the seed exchange programs. In checking with the drug store that handled copper carbonate, we find they sold over 20 times as much copper carbonate this year as last.

The copper-carbonate project needs more attention. Farmers should be cautioned about closing their drills too much, for copper-carbonate treated wheat does not run as freely as untreated or formaldehyde-treated wheat, and there is danger of grinding the wheat which happened with three different farmers, and one farmer broke his drill. - M. E. Stebbins, County Agricultural Agent, Glasgow, Valley County.

Nebraska

We cooperated with the extension agronomy people in sending out a circular letter to 1,000 farmers in the west half of the county. We sent only to those people that had grain binders. Thirty-seven replies were received from the circulars, stating that they were interested in getting additional information on how to treat wheat by the copper-carbonate method. As a result of this, 10 demonstrations were held in the precincts from which the cards were received. Two hundred-eleven farmers attended the meetings. At the demonstration meetings we used a commercial seed-treating machine, and as a result two groups of farmers purchased one. A farmers' elevator bought another. All of these machines were arranged so that they could be run by power. The three machines treated approximately half of the wheat in the county that was disinfected. Many farmers hauled their wheat miles to be treated. Twenty-two home-made machines were made.

It is estimated that approximately 6,060 acres were sown with treated wheat. The druggists in the county handled the copper carbonate and it has been reported that 1,050 pounds were used. In 1924, 800 acres were sown with treated wheat. During June a careful check was made on farms where this seed was sown. At no farm did we find smut where the wheat had been treated with copper carbonate. On two farms check plats were prepared with untreated wheat, sown beside treated wheat. The following results were found:

L. C. Wright farm -----	Treated	1.5 per cent	Untreated	33.0 per cent
John Kitchen farm -----	"	2.0 "	"	61.0 "

The seed at the Kitchen farm was threshed separately. The treated field went at 25 bushels and the untreated at 8 bushels. If we can consider the Kitchen field an average, the 800 acres sown with treated wheat produced 13,600 bushels more wheat than they would have had the wheat not been treated against smut. It was in this particular neighborhood that the elevator purchased a smut treating machine and put it in for public use. Eighty-five per cent of the wheat in this particular section of the county was treated against smut this fall as a result of the demonstration on the Kitchen farm in 1924. Alvah R. Hecht, County Agricultural Agent, Lexington, Dawson County.

Wheat smut, stinking smut, or bunt took its usual heavy toll from the untreated fields. Out of the 200 farmers who used the copper-carbonate treatment last year, fully 85 per cent treated again this year, and influenced many more to do so. Most wheat growers who treated got excellent results last year, but there are a few who had a few kernels of smut and condemned it on that account, thinking that results should be 100 per cent. After running down all rumors that came to me, I have failed to find one field planted with treated seed that had over a trace of smut.

The greatest difficulty is to get farmers to do a thorough job of mixing the dust with the wheat. Many practice scooping or mixing in the drill box. This method will not give the efficient results which can be obtained by machine mixing. This year we recommended the use of a commercial machine and persuaded a dealer to put in three mixers. One of these was sold, and is giving splendid satisfaction. It was purchased on a cooperative basis by five wheat growers. About 100 barrel mixers were in use this year. This is an economical and quite efficient method of mixing copper-carbonate. Vincent J. Heine, County Agricultural Agent, Holdrege, Phelps County.

One of the outstanding projects for 1925 from the financial standpoint was the smut control for wheat. A conservative estimate of the 66,000 acres of wheat in Red Willow county in 1925 was that 10 per cent was infected with smut of the bunt type. Last year approximately 80 farmers treated for smut. Letters with return cards were sent out to these men in July and the replies of 60 were tabulated. These 60 replies were well distributed throughout the county and practically every farmer was able to report some results in 1925. This was especially true during the harvesting and threshing season, when smut was a live topic. As a result of the work done in 1924, copper carbonate was available to every farmer through his equity union elevator handling the product at a uniform price. The orders for the county were pooled through the farm bureau and distributed to the elevators as they were in need of it. This also gave the equity union elevators as well as the old line a chance to push the product because it is part of their program in handling smutty wheat. Elevators actually sold 7,795 pounds within the county to approximately 475 farmers, 400 of whom treated for the first time, this treated acreage making about 60 per cent of the total wheat acreage for 1926.

Letters were sent to each farmer in July stating the results obtained from those who treated in 1925, also where the material could be purchased and how plans could be obtained for making a home-made mixer by returning the inclosed post card. Quite a few farmers were not thorough in their method

of treating, some trying to mix in a wagon box and others in the drill box. However the majority were thorough in their method and used a closed container. No definite check-up system was followed this year to determine who treated and the amount. However, the elevators were able to give a fairly accurate estimate and the success of the project will be measured in estimates according the the elevators as they receive the wheat in 1926. - Irvin S. Ulrich, County Agricultural Agent, McCook, Red Willow County.

Nevada

Prior to 1924, local wheat growers used copper sulphate or formaldehyde solutions to combat smut of wheat. In 1924, 6 farmers were induced to give the then comparatively new dusting method a trial in Washoe County. They treated 125 acres with copper-carbonate dust and no trace of smut was discovered. Its effectiveness was shown by the experience of 2 farmers who purchased seed known to be smutty. One of these men planted the seed he purchased without any treatment for smut while the other dusted his with copper carbonate. The crop of the first man turned out to be badly infected with smut, but the crop given the copper-carbonate treatment was clean and free from any trace of smut. These results were passed around to other farmers with the result that this year we had 17 men adopting this method and 474 acres planted with seed given the treatment. The 1925 census credited Washoe County with 1,500 acres of wheat. According to these figures, a third of the wheat grown in the county was given the improved treatment. - Thos. Buckman, County Agricultural Agent, Reno, Washoe County.

New Mexico

Approximately 800 pounds of copper-carbonate compound were used in treating wheat in the county this fall. This was used to treat wheat that was planted on approximately 3,500 acres. Dozens of farmers treated their wheat that had never treated before. It is hoped that a good wheat crop will be obtained as a result of the campaign that was carried out during the past summer. Only 4 or 5 farmers used the formaldehyde treatment for smut control this fall, and over 40 used the copper-carbonate method. - R. L. Strong, County Agricultural Agent, Mosquero, Harding County.

North Carolina

A good portion of the seed wheat is treated for smut with the formalin treatment, but plans are being made now for the installation of equipment for using copper-carbonate dust another year. - W. G. Yeager, County Agricultural Agent, Salisbury, Rowan County.

North Dakota

Examination of wheat at threshing time showed an unusual amount of smutty wheat this fall. A survey was made of 18 elevators in the county in order to get their figures on loss from smut. There were 18 elevator men that reported 18 per cent of all wheat brought in was smutty, individual lots running from 1 and 2 per cent to 50 per cent. They also reported that 17 per cent of the wheat brought in was docked an average of 7.4 cents per bushel on account of smut. They estimated that 75 per cent of the wheat growers were doing some treating of seed for smut. It appears from their reports that Durum wheat was most often smutty. Figuring that the average elevator handles 60,000 bushels of wheat per year, 17 per cent of it being docked 7.4 cents per bushel, we have 183,600 bushels of smutty wheat docked 7.4 cents per bushel or a loss of $12,586.00 on the wheat brought to the 18 elevators. Indications are that smut is on the increase in Pierce County and that Durum is most affected. Attention is also called to the fact that not all treating is done with sufficient care to make it fully effective. More attention must be given to treating seed grain next spring or we will be faced with a still greater loss. - H. R. Danielson, County Agricultural Agent, Rugby, Pierce County.

Ohio

Thirty-eight demonstrations of copper-carbonate treatment for smut were started this year. Sixty-five such demonstrations were started last fall, but due to the serious winterkilling of wheat very little data was obtained relative to the success of the treatment. In the few cases that were checked up this year the treatment was found to have given excellent results. - E. W. Hawkins, County Agricultural Agent, Springfield, Clark County.

Oregon

Copper-carbonate for control of wheat smut is not being carried as a project for 1925. However, widespread publicity was given in season relative to the use of this material, and dealers were assisted in obtaining quality stocks and furnished with supplies of mimeographed instructions for its use. Copper-carbonates now is standard for smut control in this county. - Paul Carpenter, County Agricultural Agent, Baker, Baker County.

Copper-carbonate treatment for the control of grain smut has been the principal line of work in connection with crop diseases. The use of this treatment is becoming more and more a standard practice in Lake County. This year assistance was given in building three treating machines as described in Oregon Extension Bulletin No. 381. A number of farmers are using dust-tight boxes mounted on an axle as a means of applying the treatment.- Raymond G. Larson, County Agricultural Agent, Lakeview, Lake County.

Twelve demonstrations were conducted during the season to compare copper-carbonate with treatments in common use for the control of stinking smut of wheat. Copper carbonate for these demonstrations was donated to the county agricultural agent. A wheat-treating machine was lent to the county agricultural agent for demonstration work. He also built a barrel treating machine after the plan worked out by George Kable, of the Oregon Agricultural College. Two demonstrations were given on the treating of wheat with copper-carbonate. Seed for six of the demonstrations was treated by the county agricultural agent, and seed for the remaining six was treated by the co-operating farmers.

The 12 copper-carbonate demonstrations were inspected during July. It was found that there was no smut in any of the fields regardless of whether copper carbonate, bluestone, or formaldehyde was used to treat the seed. In only one instance was there any noticeable difference in stand between plats where the seed was treated with copper-carbonate and where bluestone or formaldehyde was used. Ralph Lynch, of Lorane, treated his seed wheat with formaldehyde and then held it about three weeks before seeding. The stand was much poorer where this seed was used than where the copper-carbonate treated seed was used, and the plants were about 6 inches lower at maturity. In all other cases the farmers planted their formaldehyde or bluestone-treated wheat within 24 hours after treatment and there was no apparent seed injury.

In spite of the fact that the demonstrations conducted this year were not specially favorable to copper carbonate, more than half of the demonstrators were convinced of the superiority of the new treatment and have either treated wheat with copper carbonate this fall or will do so next spring. The main reason why they are turning to copper-carbonate is the realization that it is frequently impossible to sow wheat immediately after treatment, and the knowledge that seed will be injured if treated with formaldehyde or bluestone and then held in storage, while such will not be the case with copper-carbonate. At least three stores in Eugene stocked copper carbonate this fall and all report a number of sales.- O. S. Fletcher, County Agricultural Agent, Eugene, Lane County.

As a result of previous demonstration and successful practice, 95 per cent of wheat was dry treated, saving approximately 50,000 bushels of seed, distributing labor to better advantage and proving of tremendous value to county during the long dry fall of 1925.

No figures are available on the spread and use of copper carbonate but a conservative estimate would indicate an increase in the use of this method of about 1,000 per cent. Farmers who have used this method the last 12 months report success not to be obtained by the use of formaldehyde.

Seven meetings attended by 607 people were held at which the discussion of the copper-carbonate method of treating wheat for smut was explained, and a small home-made mixing machine was used to demonstrate the principle.

No record is available on the number of mixing machines in operation in the county at this time, but the increase in the use of copper carbonate and the making of these machines has become more or less general.

Wm. Gregg, Hillsboro, R. 3, Oregon, reports this treatment was worth 30 acres of spring grain to him this past season. Mr. Gregg states that this 30 acres would have been a failure under the old method of formaldehyde treatment due to peculiar weather conditions.

This fall being exceedingly dry, several fields of grain treated with formaldehyde have failed to give a good stand of wheat. Those using copper carbonate are highly satisfied with this treatment because under dry weather conditions which existed the copper-carbonate treated grain was not injured as was the grain treated with formaldehyde. - O. T. McWhorter, County Agricultural Agent, Hillsboro, Washington County.

Pennsylvania

Stinking smut, or bunt, in wheat was more prevalent in some sections of this county this year than formerly. Farmers were unacquainted with its control. To acquaint them with the most up-to-date control method, the copper-carbonate dust treatment, a demonstration was conducted in Carlisle with the coöperation of W. B. Barnitz, a local grain dealer who procured the copper carbonate and constructed a barrel-treating mechanism for the free use of all who wanted to treat their seed wheat. One barrel, 175 pounds, of copper carbonate was used in treating by farmers. This was sufficient to treat 1,000 bushels seed wheat. - P. L. Edinger, County Agricultural Agent, Carlisle, Cumberland County.

Four demonstration meetings on the use of copper carbonate in controlling stinking smut in wheat were held in four sections of the county, Upper Mt. Bethel, Forks, East Allen and Hanover Townships. Enough copper carbonate to treat about 5,000 bushels of wheat was distributed. The majority of this was handled at cost by milling companies interested in controlling this disease. - B. L. Coleman, County Agricultural Agent, Easton, Northampton County.

South Dakota

Seventeen farmers used copper carbonate for treating seed wheat, for the first time, upon the recommendation of this treatment by the county agent. A total of 2,400 bushels was treated. - J. A. Salisbury, County Agricultural Agent, McIntosh, Corson County.

Utah

In September, 1923, a series of demonstration meetings were held to arrange for demonstration fields and smut control by use of copper carbonate. These were followed up carefully during growth in 1924 and checked at harvest time. All of the demonstrations were successful and the farmers treated seed for about 3,200 acres.

This year we have been interested in the results of the general use of this new treatment. The demonstrations were successful, but could all of the farmers get uniformly good results? The check made on fields in all parts of the county indicates that an affirmative reply can be given to this question. Only one failure was found by the agent and it was traced to carelessness as to quantity of dust used on extremely smutty wheat. - A. L. Christiansen, County Agricultural Agent, Tooele, Tooele County.

Virginia

Increasing prevalence of stinking smut of wheat demanded attention, and brought out cooperative effort on the part of millers to stamp it out with as little economic loss as possible. After considerable effort 2 treating machines for the copper-carbonate dust method were installed in mills well located to handle the job for those who would not take the trouble to home treat, and 6 barrel outfits were made to handle private and community lots of seed, so that the volume of dust used was a little less than 9 barrels - 1,560 pounds - which treated 11,000 bushels of seed. A

record of those treating seed will be used in 1926 to check the effect, which I may say is not doubtful as this treatment was twice demonstrated in Loudoun before - J. R. Lintner, County Agricultural Agent, Leesburg, Loudoun County.

The copper-carbonate dust treatment for stinking smut in wheat has increased from the use of about 40 pounds last year to 150 pounds this year, treating something like 1,200 bushel of seed wheat, by over 100 farmers. Arrangements were made with one of the drug stores in the county to buy copper-carbonate in bulk and sell it loose to the farmers. This made a difference of 33-1/3 per cent in the cost. The Smith-Hughes teacher and county agricultural agent cooperated in this project. E. G. Stokes, County Agricultural Agent, Lunenburg, Lunenburg County.

Probably the most important work accomplished in connection with farm crops was done in holding in check (but not eradicating) stinking smut in wheat, which has gained considerable headway in many sections of the county. Several special meetings were held, articles were published in the newspaper and seed-wheat treating was discussed at various farmers meetings, picnics, and the like. The copper-carbonate treatment was recommended. Arrangements were made with the Farm Bureau, Broadway Milling Company, and Spring Creek Mercantile Company for furnishing materials to the farmers. Six hundred and twenty five pounds of dust were used by more than a hundred farmers, and many others had to resort to the use of formaldehyde on account of the limited supply of copper-carbonate when it was needed. Although we are sure that much good has been done in this work, we are still expecting to find a great deal of smut in 1926. - C. W. Wampler, County Agricultural Agent, Harrisonburg, Rockingham County.

This project was outlined as a minor project, but due to the prevalence of smut, became one of the largest projects of the year. The amount of work done was more than the project should have required but was made necessary by the delay of farmers in placing orders for the copper-carbonate and the difficulty experienced in getting shipments of the materials. Had not the agent personally attended to the ordering and delivering of the material it is very doubtful if it could have been obtained in time for use this year. As a result of the work, 295 bushels of wheat were distributed to 85 farmers. This was enough material to treat 2,360 bushels of wheat, or enough to seed 1,888 acres. Should this treatment improve the market quality of the wheat 3 cents a bushel on an average yield of 12 bushels per acre the return to the county will be $679.68. - C. Carter Chase, County Agricultural Agent, Montrose, Westmoreland County.

Washington

The copper-carbonate treatment for smut, introduced 2 years ago, has been adopted by 70 per cent of the farmers on at least 125,000 acres of wheat. At Ruff, only 1 farmer in a district raising 18,000 acres of wheat, is reported as still using the wet treatment, all others using the dry. This

man's neighbor reports that his dry-treated wheat shows a stand that in a favorable season would beat his neighbor's by at least 5 bushels per acre. The average saving of seed by the new method is conservatively estimated at 5 pounds per acre. This means 10,000 bushels of seed saved for the county. At $2 per bushel, the average price this year, this means $20,000 for the county. In addition the better yields due to better stands should add $30,000 more or a total of $50,000 per year. The interest on this item alone would pay the cost of the county agent's office for a long time. - A. R. Chase, County Agricultural Agent, Ephrata, Grant County.

One of the best, and most effective subprojects carried on in Kittitas County this year was the use of the copper-carbonate treatment of seed wheat. A very well attended method demonstration and several interesting result demonstrations were held for the purposes of introducing the dry treatment and obtaining data on its use. Very encouraging and reliable results were obtained for the use of the copper-carbonate treatment and as a result of the publicity that the writer will give this treatment, it is predicted that approximately 50 per cent of the seed grain will be dry treated next year and that those farmers so represented will save at least one peck of seed grain per acre. - E. E. Mundy, County Agricultural Agent, Ellensburg, Kittitas County.

Copper-carbonate has practically supplanted copper sulphate as a fungicide in treating seed to control bunt or stinking smut. Three ounces per bushel is recommended for fall sowing and 2 ounces for spring. Several farmers, "the last to lay the old aside," used copper sulphate and formaldehyde last spring with the result that they found it necessary to re-seed. With the price of seed wheat at $2.50 to $2.75 per bushel this practice proved to be rather expensive and it is safe to assert, that in these cases at least, it will not be repeated. The only ill results reported from the dry treatment are the physiological effects on the operators, and these may be avoided by proper precautions. - A. M. Kasten, County Agricultural Agent, Walla Walla, Walla Walla County.

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